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ABSTRACT

This is another booklet in the series by the Canadian Environmental Citizenship Initiative aimed at helping people to make environmentally responsible decisions. This activity booklet is targeted at students as part of a learning campaign to help Canadians improve their understanding of the environment. The imaginary journey From the Mountains to the Sea is a trip along the Eco River following molecules of water from high in the mountains to the ocean below. The trip illustrates the interdependence of all parts of the ecosystem and shows how the environment cannot be divided into distinct areas for study because air, water, land, plants and animal life are all interrelated. Many activities are suggested throughout the booklet to do both in and outside of the classroom. (AIM)

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Environmental Citizenship

From The Mountains To The Sea

A Journey in Environmental Citizenship

Environment Canada | Environnement Canada

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Environmental
Citizenship

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A Journey in Environmental Citizenship

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From The Mountains To The Sea

Have you ever stopped to consider that the water you used for your shower this morning may have been used by your great-great-great-grandmother to wash her clothes two hundred years ago? Or, some dinosaur may have walked in the same molecules of water which you used to brush your teeth?

Every molecule of water that was present when the earth was formed is still present today in one form or another. It may be frozen in ice, suspended in a gaseous state in the atmosphere or it may be in liquid form as in the river which runs through your region.

The water, air and land which support life on the planet Earth have all been here since the beginning and are all essential to our survival. As citizens of the world, we do not have a good history of managing our environment well - we have taken our resources for granted and have often abused the resources which we inherited.

The good news is that we are becoming aware of past misuses and are beginning to change - slowly, maybe, but changing still. There is still much to be done and there is much that we can do.

Travelling Along The Eco River

This journey with the Eco River is a voyage which will take us through our Canadian neighbourhoods by following molecules of water from high in the mountains to the ocean below. The journey will illustrate the *interdependence* of all parts of our *ecosystem* and show how we cannot divide our environment into distinct areas for study because air, water, land, plants and animal life are all *interrelated*.

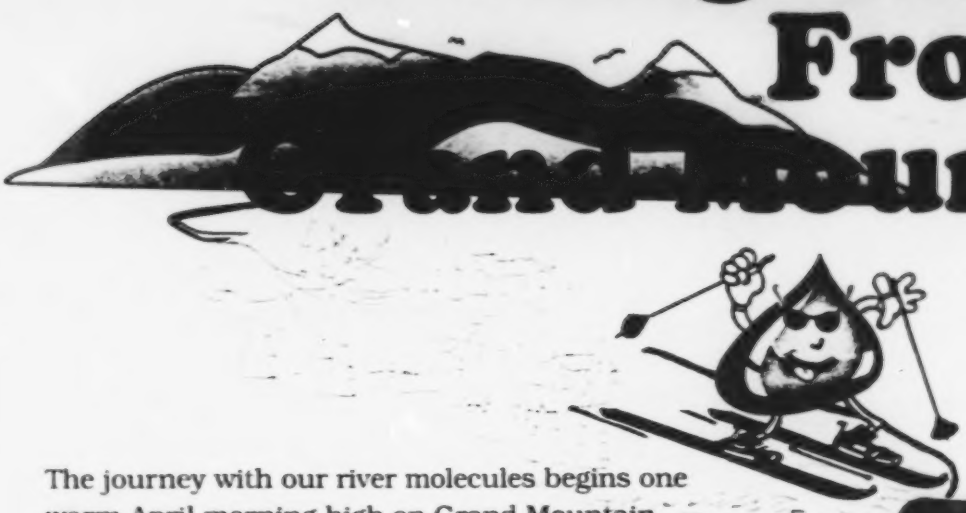
What Can You Do?

As we travel with the river from the mountain to the ocean, we will discover that there are many things we can all do to promote positive changes in the world around us. There are activities you can do alone, with a group, around your school, and in your community. And there are activities that you can do with your family. And when you complete these activities you will have begun your own journey - a journey in environmental citizenship.

What is Environmental Citizenship?

Environmental Citizenship is a personal commitment to learning more about the environment and to taking responsible environmental action. Environmental Citizenship encourages individuals, communities and organizations to think about the environmental rights and responsibilities we all have as residents of planet Earth. Environmental Citizenship means caring for the Earth and caring for Canada.

Setting Out From Grand Mountain



The journey with our river molecules begins one warm April morning high on Grand Mountain. The energy from the sun's rays melts the snow and frees the molecules to trickle into the valley below and join Eco River.

Some of these molecules have been down Eco River before. They know that sections of the journey ahead may be perilous. There will be many side trips - they will be taken into water and wastewater treatment facilities, into farmers' irrigation systems, become part of

All the Rivers Run into the Sea... Why don't the Oceans Overflow?

When we think about the water cycle, we often forget the importance of the atmosphere and the role it plays in distributing water around the earth. The water molecules which travel with the river from the mountain to the ocean had to get to the mountain some way. They did not travel up the river because water does not flow uphill.

Study the diagram of the water cycle and note the number of functions which occur in the atmosphere - and don't forget the winds which carry clouds all around the earth. Now, explain in your own words the story of one water molecule's journey to the top of the mountain.

Investigate Your Local Environment

How familiar are you with weather patterns in your area? Why do areas near mountain ranges get more rainfall than flatlands?

How does the *precipitation* in your area compare with other regions in your province or territory? Compare the precipitation in your province with other provinces or territories.

Record the precipitation in your local region over a two-week period. Check with Environment Canada weather offices, newspapers, weather forecasts. What is the average rainfall? What was the record for most/least rainfall?

The amount of rainfall which falls in a region quite often depends upon the location of geographical landforms like mountains. Is this a factor where you live? Draw a map of your area explaining why you get the weather you do.

Weather patterns affect the kinds of plants and animals which inhabit a region. What kinds of plants and wildlife are native to your area?

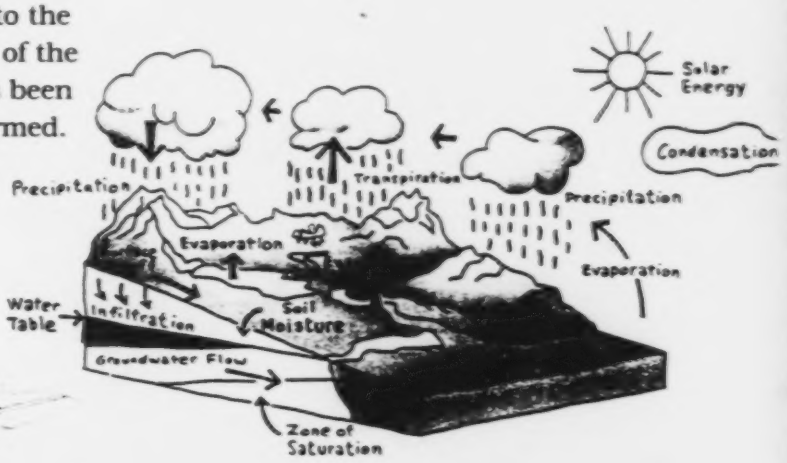
industrial waste, travel through narrow pipes and sewers, and wash over many of your bodies. Some will be drawn into the atmosphere and be carried by winds to other parts of the earth. This might not be an easy ride.

On the other hand, there will be peaceful and uneventful cruises through wilderness areas, parks and other protected regions - places where they can count on no pollutants from humans being dumped among them, they will not be dragged through pipes, and they will flow close to wild animals and plants by the shores.

A number of molecules will not make it all the way to the ocean this trip - they will seep downward from the earth's surface to become part of the *groundwater*, or they will *evaporate* into the atmosphere. Either way, they remain part of the *water cycle*, or *hydrologic cycle*, which has been in constant motion since the earth was formed.

The Water Cycle

Water is always in motion, constantly circulating from the atmosphere to the earth and back again to the atmosphere. This unending process is called the hydrologic or water cycle. There is no starting point or end point to the cycle because water changes form but does not disappear. For example, water molecules can fall as precipitation, then be carried to the sea by rivers and groundwater before being transferred back to the atmosphere by transpiration and evaporation. Water in the cycle can move through three different forms - as a liquid, solid, and vapour. The energy that causes the water to change form, and so continue the cycle, comes from the sun.



Evaporation - As water is heated by the sun, its surface molecules become sufficiently energized to break free, evaporate and rise in the form of vapour.

Condensation - As the water vapour rises, it cools and condenses to become a liquid or a solid. These water particles then collect to form clouds.

Precipitation - When clouds cool, the water falls as rain, snow or hail, depending on the surrounding temperature.

Surface runoff - Water that drains by running across the earth's surface, eventually taking water back to the ocean.

Infiltration - Surface water that moves downward or infiltrates through cracks, joints and pores in soil and rocks.

Transpiration - Water vapour is released from plant leaves through a process called transpiration. Each day a plant is capable of transpiring 5 to 10 times as much water as it can hold.

Water table - The water table marks the change between the zone of saturation, where all the spaces are filled with water, and the zone of aeration, where some pores are open.

Groundwater - Water stored below the earth's surface in the saturated zone.

DID YOU KNOW?

World Water Budget

There are approximately 1.4 billion cubic kilometres of water on our planet. It is stored as: surface water (oceans, rivers, lakes, snow, glaciers); water in the atmosphere; and water underground (groundwater). Unfortunately, almost all of the water is unavailable for drinking purposes. Of the world's total water supply, 97.47% is salt water and 2.53% is fresh water, some of which is stored as ice. Only a small fraction of this amount, 0.01%, is available for meeting our fresh water needs, and is found in rivers, lakes, in the ground and in the atmosphere.

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Cascading Through Forests And Wilderness

As the water molecules continue downstream, Eco River speeds past and over snow-covered rocks, cascading through woodlands to the valley below, following a trail it carved through the landscape long ago.

Stands of spruce and pine line the shoreline; wildlife roams freely; overhead Canada Geese fly north to their nesting grounds; buds form on trees; spring blossoms and wild plants push up through rich, damp earth. These forests and wilderness areas form the *habitat* for a variety of wild plants and animals.

PLANET EARTH

Planet Earth is a large *ecosystem*. This means that all of Earth's plants and animals are dependent on each other and the non-living environment for food and shelter. If the sun, atmosphere, land, water or any other part of the ecosystem changes, other parts can be affected. When lake *acidity* increases, for example, plants may die. *Herbivores*, animals that eat plants, would either die of starvation, or be forced to move to another lake. Meat eating animals (*carnivores*) who are *predators*, would also die or have to move. The transfer of food or energy from plants to herbivores to predators is called a *food chain*.

Make a poster showing a food chain, tracing a route from simple plant life to your dining room table. As part of your poster, show how emissions into the atmosphere from human activities can affect this food chain.

Explain your poster to the group.

WHY DO PEOPLE PLANT TREES?

Did you know that trees remove carbon dioxide from the atmosphere and incorporate it into their biomass? What do animals/humans do with carbon dioxide? oxygen? Why is there concern about the destruction of the tropical rainforests? Did you know that Canada has rainforests? Research to find out where they are located.

What Is the Value of a Tree?

Pretend you are a tree. Write your life story. What is your relationship with all the other aspects of the environment - water, air, soil, wildlife, humans, other plants? Why are you valuable? What would you ask people to do for you? How can people use you to help the environment?

Horror Story: All of the trees in the world are being cut down. What will happen???

Quick Contest: Working in groups or teams: Who can come up with the most reasons why trees are important?

Research: The paper you are looking at right now was once a tree and has been recycled. Trace the route it took to get from the forest to you.

Recycling 1 tonne of newspapers saves 17 trees. Weigh your family's newspapers for one week. How long does it take your household to read 1 tonne of newspapers?

In Your Backyard

Build a birdhouse
Set out bird feeders
Plant flowers, bushes, a tree

The Molecule Reporters for ECOSTAR

You are a molecule reporter who is *transpired* into the atmosphere from the leaf of an oak tree. Unfortunately, you are carried into a series of weather changes which keep you spinning for two months from a thunderstorm's roller-coaster ride, coughing through industrial smoke, not to mention crashing to earth as a hailstone. You are exhausted! You have seen Canada from all angles, overhead, underneath, and on the surface.

How would you report your story to your news editor? As a travel feature? A human interest feature? A report on the pollution you ran into? An editorial? Series of cartoons? Think of the way you would like to describe your adventure and then present it to your group.

As a group exercise, different individuals could take the roles of various newspaper contributors and the whole group could publish *ECOSTAR*. Describe the speeds you were travelling; the different landscapes you saw; the awful pollution you ran into; the hot and cold temperatures; near escapes like being frozen in an iceberg or trapped in a waste treatment plant; the pleasant drift over a park.

***Cartoon sequence*: Using a series of cartoon panels, show the journey of a water molecule travelling through the atmosphere from the ocean back to the mountain stream. Show the same molecule making the journey in July and again in January. What different experiences might occur? What might happen if air currents carry the molecule to the Arctic?**

***What if?...* Suppose the atmosphere decided to take a day off from the water cycle and rest. It was tired of being overlooked when people thought of water and the water cycle. What might happen to the oceans? the rivers? the land? animals and plants? YOU???**

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Animals, Plants, Birds, Fish...

The Eco River molecules enjoy zigzagging through the forests and wilderness because it brings them close to all kinds of animals, plants, birds and fish.

Wildlife is important to Canadians. We all enjoy wildlife and nature from time to time, whether it is a walk in the park, setting up bird feeders in the backyard, joining conservation groups, or more active pastimes such as hiking, hunting, canoeing, camping or wildlife photography.

A number of Canada's native people appreciate the direct value of wildlife for food, clothing, and hunting, while others get income from fishing and trapping.

A healthy wildlife population tells us about the health of our environment on which we depend. For example, if our trees are dying, if species of animals are disappearing, people are alerted to action.

The two main threats to Canadian wildlife are loss of habitats like forests and wetlands, and environmental contamination.

Endangered Wildlife

Use the library or local wildlife conservation organization to find 5 examples of animals, birds or plants which are endangered in Canada.

- Make a booklet with a page or section for each animal.
- Include the name, a picture, the habitat, what activities are endangering its survival and measures being taken to ensure its survival.
- Make recommendations of your own for conservation and protection of the species you have chosen.
- Variation: Make a poster about one of the subjects in your booklet. Write a poem and include it on the poster.

Idioms and Clichés

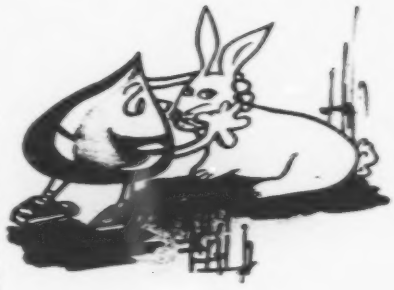
What do we know about animals? We say, "As blind as a bat," or "Sly as a fox," but are these old sayings true?

Can you think of others related to animals?

Where do you think they came from? Research to find out if a bat is really blind, or why a bee is so busy. Is a fox sly?

BE A FRIEND TO WILDLIFE

- For more information on animals and their habitats, write to:
  Canadian Wildlife Service
  Environment Canada
  Ottawa, Ontario
  K1A 0H3
- Write the Canadian Wildlife Federation to find out about Habitat 2000, a school program to help young Canadians complete wildlife habitat improvement schemes.
  Canadian Wildlife Federation
  2740 Queensview Drive
  Ottawa, Ontario
  K2B 1A2
- Write the World Wildlife Fund for suggestions about helping wildlife. They have developed Operation Lifeline, a school program which involves young people directly:
  World Wildlife Fund
  60 St.Clair Avenue East
  Suite 201
  Toronto, Ontario
  M4T 9Z9
- Find out how to adopt a species which is threatened, like a panda, whale or duck.
- Raise money to buy a hectare of rainforest or contribute to helping wildlife.
- Volunteer your services.
- Join or support a conservation group in your school or community.
- Write letters to different levels of government.
- Involve your school.
- Raise money for environmental causes.
- Pick up roadside litter.



DID YOU KNOW?

SUCCESS STORIES – WILDLIFE

Thanks to the work of wildlife conservation groups and governments, efforts have been made to help endangered wildlife.

Here are some examples of "good news" stories:

- The White Pelican was taken off the endangered species list in 1987.
- The wood bison was downgraded from endangered to threatened in 1988.
- Over the next 5 years, 30 Peregrine Falcons a year are being re-introduced to the Bay of Fundy region.
- Environmental and governmental groups are helping to conserve wetlands and waterfowl habitats.
- Canada and other countries are banning the import of ivory to help protect the African elephant from being killed for its tusks.

BECOME A BAT'S FRIEND??

- Select a creature or plant that you may see as a nuisance and research its place in the wildlife kingdom (snake, mosquito, rat, bat, poison ivy...).
- Become a spokesperson or friend of your selection and explain its value to your group.
- Write a radio or T.V. broadcast and perform it in front of your group.
- Write a poem or story from its point of view.

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The Eco River Flows Through Time

The water molecules now travelling with Eco River have at one time probably flowed through the same water supply that is close to where you live. If you live near a major city in Canada, chances are there is a major water body nearby. Water is a fundamental part of our history.

Fun Time

HOW MANY WORDS ARE IN ENVIRONMENT?

Working alone or with a partner, see how many words of three letters or more that you can make from the word ***environment****.*

Set yourself a time limit. Have someone check your list for accuracy and spelling. Deduct one point if you make a mistake.

ALPHABET WILDLIFE

Beginning with the letter A and working your way through the alphabet, list a wild animal for each.

Do the same for plant life.

Bird's-Eye View of Canada

Look at a map of Canada. Note where most of the major towns and cities are located. You will observe that they are either near the ocean, near other large bodies of water, or have rivers running through them. Why do you suppose this is so?

- List the capital cities of all provinces and territories. What water bodies are they near?
- Research: What is the capital city of your province/territory? What is its relationship with a large body of water? Water supply? Waste disposal? Transportation? Industries?

Canadians are lucky. Canada holds 9% of the world's renewable fresh water - more than its share if water were divided equally among all countries, especially since we have less than 1% of the world's population.

Many people living in rural areas of Africa and Asia do not have access to safe drinking water or proper sanitation facilities. This contributes to a style of living that is very different from ours.

Fun Time

CODED MESSAGE

Decode the environmental message below using the letter and number code provided.

(A)

15,13,25,26,17,23,13,22,15,13,16,6,7

18,26,16,26,12,15,13,10,14,26,11

26,10 6,20,23,9,16 20,15,18,23,22,26,13,4

26,13,8,23,17,22,15,1 6,13,1

4,15,16,16,26,13,4 26,13,25,23,7,25,15,1 .

(B)

9,10,15 3,6,16,15,17 3,26,10,15,7,24 6,13,1

15,8,8,26,18,26,15,13,16,7,24 – 26,16'10

4,23,23,1 8,23,17 16,14,15

15,13,25,26,17,23,13,22,15,13,16 6,13,1

10,6,25,15,10 22,23,13,15,24 !

A	B	C	D	E	F
6	20	18	1	15	8
G	H	I	J	K	L
4	14	26	2	19	7
M	N	O	P	Q	R
22	13	23	11	5	17
S	T	U	V	W	X
10	16	9	25	3	21
Y	Z				
24	12				

Make up your own message for a friend.

WATER USE

Of the water used in an average Canadian household, approximately 45% goes for toilet flushing, 30% for bathing and showering, 20% for laundry, and 5% for drinking and cooking.

a. Use a bar graph or circle graph to illustrate these percentages.

b. If the average Canadian uses 340 litres per day, calculate how much water your family uses for each of the above.

c. How is water priced in your community? Do you use meters to determine how much each household is charged or is there a *flat rate* which everyone pays no matter how much water is consumed? Why is it a good idea to price water? Which method will control water waste best, a flat rate or a metered system?

d. The average household uses 25,000 to 35,000 litres of water per month. Today, the cost to this household for 35,000 litres of water varies from $11.25 a month in Quebec to $34.85 in Manitoba. What is the *yearly* difference between these two provinces? (Why do you think there is such a difference in rates?)

e. Check your family's water bills for the past year. What was the total volume of water used? How much was used each month? How does this compare with 35,000 litres? Find the amount of water used in your house each day. Then calculate how much water each person in your house uses each day?

f. Brainstorm with your group or class to list how many ways you can conserve water. Think of home use, inside and outside, school use and community use.

Groundwater – The Hidden Resource

As Eco River meanders through the wilderness and into the countryside, it keeps losing and collecting water molecules. Some of these molecules seep into the ground and join the groundwater underneath the earth's surface. It might be a long time before these molecules rejoin the others because groundwater moves slowly, anywhere from a few millimetres to 1 or 2 kilometres each year.

Did you know that two thirds of the world's fresh water is found underground? Over six million Canadians depend on this *groundwater* supply for their drinking water, which is replenished by the rainfall seeping down to the water table.

How Can the Ground Hold Water?

To get an idea of how much water the ground can hold, fill a glass with dry sand. Now add water to it. You will be surprised how much water can be stored between grains of sand. Did you know that there is thirty times more water underground than there is on the earth's surface?

What Else Can Be Stored Underground?

Unfortunately, pollutants can also seep down to the water table and once there, they move very slowly through the soil. Contaminated groundwater can affect users for a long time because it is harder to detect and clean up.

Some groundwater pollutants are:

- pesticides and fertilizers from agricultural activities
- gasoline that leaks from storage tanks
- road salt
- landfill sites and garbage dumps
- chemicals and hazardous wastes such as cleaning solvents
- leaky septic tanks and sewers.

Prepare a presentation using a poster illustration to show how groundwater can be contaminated. Emphasize how important it is that we protect this valuable resource.

Home Check: Look around your home for substances which could create problems if they were dumped into the sewers or taken to landfill sites. These would include items like leftover paint, paint thinners, cleaning solvents, old batteries, car oils, rat poison, pesticides, furniture polish, drain cleaners, and bleach.

Help your family do a spring or fall cleanup around the house. Decide which products are still useful. To dispose of harmful substances correctly, contact your municipal office to determine if and when a recycling or hazardous waste collection depot is scheduled for your area.

Find Out About Water in Your Community

Where does your water supply come from? Where does it go after use? Are there materials which go down your drain into the sewer that should not? How is wastewater handled in your community? Where does the sanitary sewer empty? Does your community have a storm sewer? Where does it empty?

Did you know that there are cities and communities in Canada which dump their sewage directly into the water without treatment? Conduct research to find out if there are cities or towns in your area which dump sewage without treatment.

Find out more about wastewater treatment in your community. If there is a waste treatment plant, have your class arrange a visit. Or if your community uses septic tanks, invite someone to your class to describe how septic tanks work.

Produce a Commercial

Write a 15-second radio spot to present to your group to convince the public to support one of the following:

1. Buy the new energy-efficient fluorescent light bulbs.
2. Plant 10 trees a year.
3. Join an environmental group.
4. Use a bus instead of a car.
5. Refuse to use plastic plates and foam cups.
6. Use a bike instead of a car.

Wetlands - A Peaceful Pause

Some of the slower-moving molecules find themselves drifting off to very still water areas where tall reeds and little movement hold them for long periods of time. The river may pass them by completely and they may become part of a small ecosystem all to themselves. This is just one example of a *wetland*.

WETLANDS

Think Time: Why should we protect and conserve wetlands? Can you imagine living without wildlife? Brainstorm with your team. Why is wildlife important?

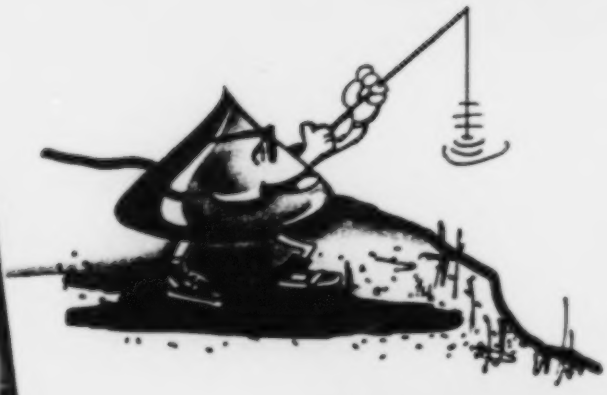
ADVERTISEMENTS

Companies often use the great outdoors and wildlife to advertise their products even though there may be little connection between the product and nature.

- Find examples of this kind of advertising in magazines.
- Is the ad related to the product? Do you think there should be a connection?
- Why is this picture used? Does it attract people? Explain.

Create your own advertisement.

1. Choose or design a product. Advertise your product to show how it is used.
2. Create an advertisement using wildlife, but relate it to a product or service that actually has some connection with the environment.
3. Design a product that is beneficial to the environment and advertise it to catch people's attention.
4. Design an ad around a threatened plant or animal. Your ad should stress the importance of this animal to our way of life.



How You Can Protect Wetlands

There probably is a saltwater or freshwater wetland near your community. Suppose it is being threatened by development. How would you organize a "Save the Wetland" campaign? Think of useful people you could contact for advice and help. Design a T-shirt, poster, sign, button or slogan. How could you help clean up a littered wetland area?

The Canadian Wildlife Service of Environment Canada, along with other Canadian wildlife agencies, conservation groups and individuals are working to improve living conditions for endangered and threatened species of plants and animals. They are trying to protect *habitats* which are being disturbed or are disappearing. What are some of the actions you could take to help wildlife in your area?

Are there wetlands in your area which have disappeared? Ask older people in your community if they can remember a wetland which no longer exists. Find out about conservation schemes near you. Contact a group or agency in your area (Canadian Wildlife Service, fish and game clubs, nature organizations). Ask their leaders for advice on what you can do.

Invite speakers into your class.

DID YOU KNOW?

Wetlands

Wetlands are also known as fens, swamps, marshes or bogs - grassy areas periodically covered with shallow waters. They provide a home and breeding ground for many plants and animals that are unable to survive anywhere else in the world. However, many people see them only as breeding grounds for pesky mosquitoes and would like to see them drained or filled.

Wetlands are facing threats from many directions. They are being drained for the development of housing and industry and for valuable farmland. The wetlands also become contaminated by absorbing pollutants from sources such as industry, settlement and farmers' pesticides.

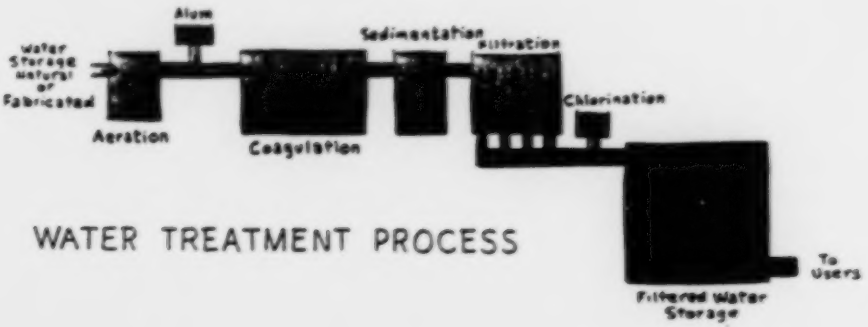
The wetlands are a *habitat* for many animals. A habitat is the scientific term for an animal's home. It provides all that the animal needs for survival - food, water, shelter and space. An animal's habitat is its neighbourhood.

Smalltown

Eco River must move on. It continues downstream, pulling the molecules from outside the wetland area to the outskirts of Smalltown.

A number of molecules flowing through Smalltown will travel along the historic *Heritage Canal* which was constructed 125 years ago and is still in good condition today because it is looked after by the Canadian Parks Service. The unique thing about this side trip through the canal is that some droplets of water are sloshed up on the decks of boats, so they get to travel uphill, through the locks system.

Other molecules familiar with this journey brace themselves. They know that in Smalltown there is a water purification plant and a wastewater treatment plant. Chances are they will have stories to tell when they find their way back to the river. The ones who get drawn into Smalltown's water supply will probably have to wash someone's body, become part of a glass of water, be flushed down a toilet, or just trickle wastefully down a drain into the sewer and have to be treated anyway.



WATER TREATMENT PROCESS

DID YOU KNOW?

Water Treatment Process

Most Canadians are served by a public water supply system. The water we drink is usually obtained from either rivers, lakes, reservoirs or groundwater. Because the water is often polluted and unsafe, the water supply must first pass through a treatment process.

1. Usually the first step is **aeration**, in which water is sprayed into the air to release trapped gases and to absorb oxygen for better taste.
2. Next, a chemical such as **alum** is used to help remove dirt from the water.
3. As the alum dissolves it forms small, sticky particles (called floc) that attract dirt and bacteria. This process is called **coagulation**.
4. The weight of the floc is enough to cause the floc to sink to the bottom during the process called **sedimentation**.
5. The clear water above the layer of floc then flows to the **filtration** basin. Here the water passes through layers of fine sand, gravel and charcoal to remove any remaining impurities.
6. Then a disinfectant, usually **chlorine**, is added to kill the bacteria that has not been removed by the treatment process.

Now the water is ready to enter the public water supply, storage and distribution system.

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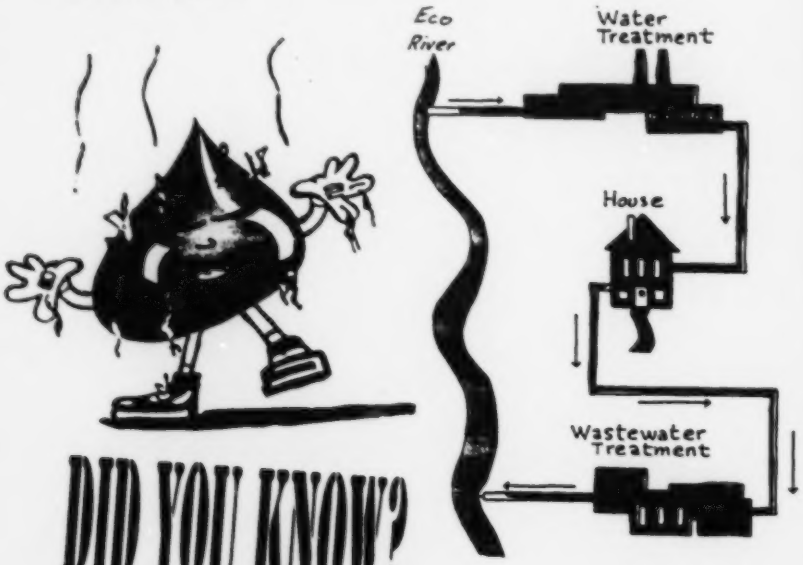
They wonder why they need to be cleaned and treated because just downstream from Smalltown there is a factory which spews untreated waste directly into the river. The pollutants from the waste bother them for miles afterward. They really understand why people do not like living downstream from these kinds of factories and industries.



DID YOU KNOW?

Wastewater Treatment

Rivers and lakes have a certain ability to purify wastewaters. They can do this by diluting the wastes with large volumes of clean water. Also, bacteria in the water consume sewage and turn it into other products. In order to do this, the bacteria need oxygen which they usually get from air and plants that live in the water.

If too much sewage is dumped into the receiving water body, the process of decomposition by the bacteria may use up all of the oxygen in the water. The result is fish and other aquatic organisms die.

To avoid this problem, cities and industries use wastewater treatment plants to remove as many oxygen-demanding wastes as possible.

Your Community

Many industries and factories treat their waste water, others do not. Find examples of each in your community.

You Be the Judge

Can this problem be resolved? You live in Smalltown, which is a one-industry town. Your parents and your friends' parents work in this industry. Tests have shown that wastes being dumped into the river from this plant are toxic enough to damage the water quality. Your beach has been closed. There are fewer fish to be caught and you dare not eat the ones you do catch.

1. **The government and the industry are working together to clean this up. The industry is trying to be environmentally responsible. (What does that mean?)**
2. **The industry says its equipment is old. It would be expensive to replace it with technology to eliminate pollution. It may be more economical to close down and move elsewhere.**
3. **Your family wants a clean environment. They know the harm the factory is doing and would like to see it cleaned up, but they need employment and they do not want to leave their community.**
4. **You and your classmates are environmentally conscious. You are worried about the long-term effects of pollution and the world you are inheriting, but you do not want to give up your standard of living or leave your friends.**

Organise a "mock" town meeting to discuss this situation. Represent each of the following at the meeting and present your problem. (As a good problem-solver, try to think of a possible solution that others would accept.)

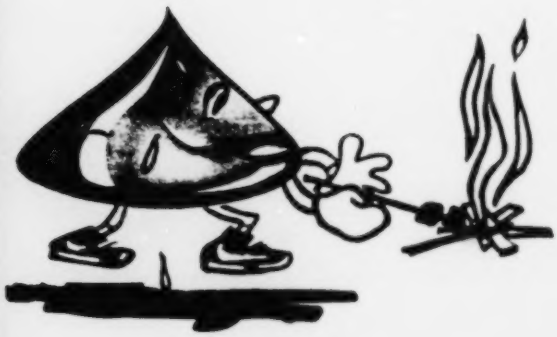
- **plant owner**
- **plant worker**
- **environmentalist**
- **town manager**
- **people who live downstream**
- **government representative**

National Park – A Protected Area

As our water molecules recover from the trip through Smalltown, they know there is relief ahead. Two hundred kilometres downstream is a national park, a wilderness region set aside twenty years ago. This protected area is removed from industry, business and civilization, and this means a relatively clean trip through the park.

Many is the time when they would have liked to take a break from their watery travels to rest awhile in the park. They have often observed hikers backpacking along the trails. They have floated by campers' tents at night. They are fascinated by the number of animals that come up to the shores, creatures which they rarely see in other parts of their travels, such as moose, deer, osprey and bears. Many molecules have been lucky enough to have visited a beaver's lodge which is built right in the river.

PARKS

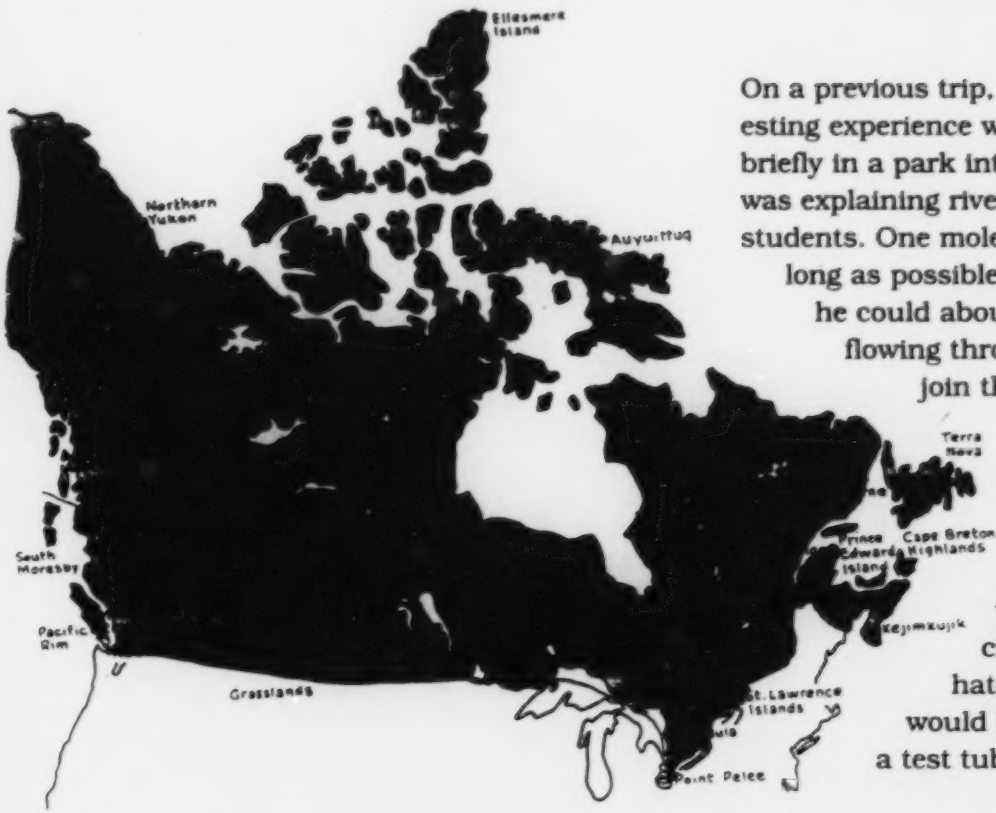


Just as the health of our wildlife population tells us about the health of our environment, national parks act as "measuring sticks" or controls to help us see the extent and effects of pollution outside the parks.

Why do you think it is necessary for the government to manage lands and rivers? Why do national parks have education programs and learning centres for park visitors?

Why does a Park Warden test the water quality? How do you think this test is done? What type of activities threaten the animals or plants in a national park?

National Parks of Canada



On a previous trip, two molecules had an interesting experience when they were caught up briefly in a park interpreter's dip net as she was explaining river life to a group of school students. One molecule clung to the net for as long as possible, trying to learn as much as he could about the territory they were flowing through, but off he slid, back to join the others moving downstream. Another molecule told a story of how he had narrowly missed being part of a Park Warden's water quality test! That would have kept him out of circulation for awhile, and he hated to think about what he would have gone through being in a test tube.

National Park/Reserve (R)	Year Agreement	Year Established	Park Area (km²)
1) Banff, Alberta	-	1885	6,640.8
2) Glacier, British Columbia	-	1886	1,349.4
3) Yoho, British Columbia	-	1886	1,313.1
4) Waterton Lakes, Alberta	-	1895	505.0
5) Jasper, Alberta	-	1907	10,878.0
6) Elk Island, Alberta	-	1913	194.3
7) Mount Revelstoke, B.C.	-	1914	259.7
8) St. Lawrence Islands, Ont.	-	1914	5.9
9) Point Pelee, Ontario	-	1918	15.5
10) Kootenay, British Columbia	-	1920	1,406.4
11) Wood Buffalo, Alta., N.W.T.	-	1922	44,807.0
12) Prince Albert, Saskatchewan	-	1927	3,874.6
13) Riding Mountain, Manitoba	-	1929	2,975.9
14) Georgian Bay Islands, Ont.	-	1929	25.3
15) Cape Breton Highlands, N.S.	-	1936	950.5
16) Prince Edward Island, P.E.I.	-	1937	25.9
17) Fundy, New Brunswick	-	1948	205.9
18) Terra Nova, Newfoundland	-	1957	399.2
19) Kejimkujik, Nova Scotia	1967	1974	383.8
20) Kouchibouguac, New Brunswick	1969	1979	238.8
21) Pacific Rim, B.C. (R)	1970/87	-	499.6
22) Forillon, Quebec	1970	1974	240.4
23) La Mauricie, Quebec	1970	1977	543.9
24) Pukaskwa, Ontario	1971/78	-	1,877.8
25) Kluane, Yukon (R)	1972	1976	22,015.0
26) Nahanni, N.W.T. (R)	1972	1976	4,765.6
27) Auyuittuq, N.W.T. (R)	1972	1976	21,471.1
28) Gros Morne, Newfoundland	1970/73/78/83	-	1,942.5
29) Grasslands, Saskatchewan	1975/81/88	-	906.5
30) Mingan Archipelago, Quebec (R)	-	1984	150.7
31) Northern Yukon, Yukon	-	1984	10,168.4
32) Ellesmere Island, N.W.T. (R)	1986	1988	37,775.0
33) Bruce Peninsula, Ontario	1987	-	270.0
34) South Moresby, B.C. (R)	1987/88	-	1,470.4
Total			**180,331.9**

Year agreement refers to year of memorandum of understanding, federal-provincial agreement or land withdrawal.

Year established refers to year park was formally created by Order-in-Council, proclamation, or enactment.

Tabulation prepared January 17, 1989, in consultation with Realty Services. Park areas reflect park boundary revisions legislated by Bill C-30.

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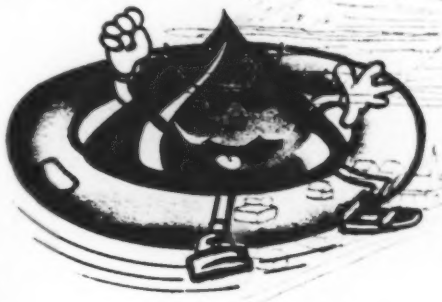
National Park – A Protected Area

It is not surprising that the water molecules enjoy national parks and other protected areas. They feel important there because people treat them with respect and they can also have fun - from sliding and dancing on the paddle of a canoeist or kayaker, to gliding past the magnificent timber stands which are protected and preserved.



Ah, Life in the Slow Lane

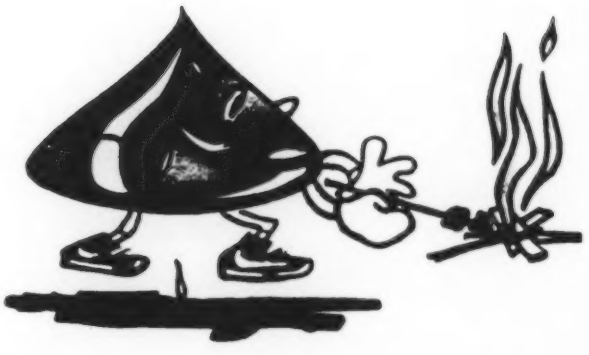
Write a play or create a conversation between two old friends, an animal which lives in a protected area like a park and one which lives in an area being encroached upon by development. What are the differences in their lives? Which is better off? Create a poster showing the differences between their lives.

DID YOU KNOW?

Heritage Rivers

To manage and protect rivers that are outstanding examples of Canada's natural heritage, Canada has the **Canadian Heritage Rivers System**. Since 1984, sections of 24 rivers, with a total length of more than 5300 kilometres, have been added to the system.

Both the Canadian Heritage Rivers System and Canadian Parks Service protect resources so that they can be **preserved** and **used** at the **same** time. This allows all Canadians to enjoy the outdoors while knowing that it is being protected for future use.



Remember that we said the water molecules would have a "relatively clean" trip through the park? We say "relatively clean" because no water in the natural environment is completely clean. Airborne pollutants from industrial emissions and automobile exhausts travel all around the world in the atmosphere and fall as acid rain and toxic rain. So make sure you do not drink water straight from a stream, even in a National Park.

A New Park

The government plans to set aside 100 square kilometres of land in your area for a national park. Local people are concerned because they will no longer be able to hunt, fish, log, camp, etc., as they used to do. As a government representative, draw up a plan which will outline the benefits of your proposal for a national park, both long term and short term.

A Day in the Life...

Describe "A Day in the Life of Carrie Caribou," or write a poem about the life of Ms Mosquito, a park resident.

Locating Canada's Parks

Using the map of Canada, note where our national parks are located. How many are there?

Is there a national park in your province or territory? Why was it located there? What unique landforms, species of animal and plant life are found there?

Why are protected areas important? What is being protected in a park near you?

Explain why you would like a park in your area. If you live close to a park already, explain why you are glad it is there.

Fun Time

WORD SCRAMBLE

The scrambled words listed below contain the names of creatures whose species is endangered or threatened. Can you identify them?

abgelu elhaw _____

apicenl _____

aadnp _____

esa treot _____

ulbe hewla _____

htenepla _____

rocndo _____

agurco _____

levinwroe _____

Camping in a Park

Have you ever camped in a federal or provincial park? Using drawings, cartoons, poetry, describe your experience. Write a story telling about something humourous or exciting which happened to you and your family in the park.

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The Trip To Bigtown

All good things must come to an end. Eco River winds through National Park and begins its slow excursion to Bigtown, a large industrial city three hundred kilometres away. This journey will take it through kilometres and kilometres of flat farmland.

The farmers whose land is close to Eco River have come to rely on the river for water to irrigate their crops because there is not much annual precipitation. While it is true that Canada has more than its share of fresh water, this water is not equally distributed to all regions of Canada. In places where water is not very plentiful, farms go through periods of *drought* and crops suffer.

From the viewpoint of the water molecules in the Eco River, the worst thing about this part of the voyage is farm *runoff*. When water from the fields finds its way back to the river, it often carries traces of pesticides, chemical fertilizers and large amounts of soil. If cattle are allowed to trample the riverbank, the soil erosion is greatly increased.

DRYTOWN

Because some areas of Canada do not receive sufficient water to meet all of their needs, many farmers, municipalities and industries are concerned. You live in Drytown, a community where most people depend on farming. A new dam has been proposed for this region and this would greatly help to save your farms. However, some members of the community do not want this dam. They say it will destroy the habitats of animals and plants, and change the whole ecosystem forever,. What do you think? List the types of information you would want to gather before you make any decisions. Who would you contact to try and obtain information on all sides of the issue?

Bigtown Has Changed

In the ten years since our molecules were last down this route, there have been a lot of changes. They are surprised to be approaching the city of Bigtown and find that the farmers' fields which used to surround Bigtown have all disappeared. New communities called suburbs have taken up the land where cows grazed and vegetables used to grow.

Even more surprising is the size of the *landfill* site which collects the garbage from Bigtown. It is enormous! Where did it all come from? Talk about making mountains out of molehills!

Garbage Dilemma

Several communities across North America are looking for new sites to dispose of their garbage. Local populations say, "Not In My BackYard!" (This is called NIMBY.) Have you heard similar remarks in your area?

Where does garbage go in your community? (To the Land of AWAY? This is opposite to the land of NIMBY. Everyone would like to send their garbage to the land of AWAY.)

Obtain or draw a map of the area where you live.

Suppose it is obvious to everyone that the present landfill site cannot serve your community for more than two years.

A new garbage dump (landfill site) is needed. Where do you think it should go? Select a new location on the map. Are there people who might disagree with your choice? Who? Why?

Why not put the garbage dump closer to where you live? Why would you not want it there?

Can you come up with a creative solution that will please everybody?

Packaging, Problems to Solve

Can you think of one negative thing that might happen if suddenly all manufacturers cut out excessive (extra) packaging right now?

Problems to Solve:

1. Many municipalities are running out of places to dump their garbage.
   a. The average Canadian produces about 2 kilograms of solid waste a day.

   At that rate, how much solid waste will be produced:
   - by you in a year? since you were born?
   - by your family in a year?
   - by your town/city/community a day?

   b. If one cubic metre of solid waste weighs 90 kilograms, how many cubic metres of solid waste are produced in your community in a day?

   c. Measure your classroom and calculate its volume. How many classrooms of solid waste do the people of your community produce each day?

   d. What are five effective ways we could reduce the volume of waste in our dumps?

Bigtown Has Changed

Fun Time

WORD SEARCH

This puzzle contains 31 words related to the world around us. Can you find them? They are listed vertically, horizontally, diagonally and backwards.

The six letters which are left over spell an environmental word.

E V R E S N O C N I A R
L D E R E T T O A E C E
C I H A B I T A T L I V
Y S T E E R T U U A D I
C P A L P S L O R B R R
E O E O O L E Z E O I I
R S W P O C A O U L B A
I E M P O G E N S G T R
R O T L U G R E E N E E
C R O L N D N A L T E W
R G E A G A R B A G E D
Y B R E A T H W A S T E

air
acid
beluga
bird
breath
compost
conserve
cry
den
dispose
ecology
garbage
global
green
habitat
nature
otter
ozone
planet
pollute
power
rain
range
recycle
reuse
river
tree
waste
water
weather
wetland

The leftover letters spell? _____

twenty two

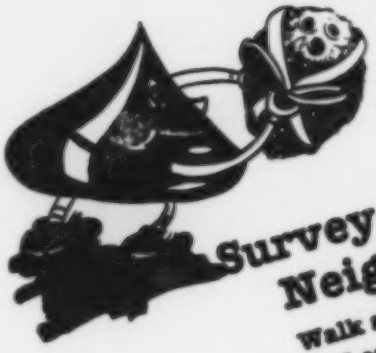
Grocery Packaging Survey or "Why Wrap a Coconut?"

Accompany your parents on their weekly grocery shopping trip.

- Make a list of all packaging used.
- Make a list of smart packaging.
- Why don't we find as many soft drink bottles and beer bottles in the garbage as we do pop cans?
- Make a list of excessive packaging – size, layers, non-recyclable, different materials.
- What is thrown away as soon as it arrives home? (Are there things your family buys that you do not need?)
- Does your family use reusable shopping bags? If not, why not?

Be Active

- Write a letter to a store manager or a manufacturer to express your feelings about wasteful packaging.
- Encourage others to do the same. If enough people write, the message will get through.
- Be a problem solver. Suggest smart packaging ideas. For example, encourage the use of reusable shopping bags; question why two grapefruits are wrapped in a tray covered with cellophane.



Survey Your Neighbourhood Garbage

Walk around your neighbourhood and catalogue the kinds of garbage that you see.

Make a chart showing three divisions:

i. Recyclable
ii. Biodegradable
iii. Disposable

Could more products become recyclable?

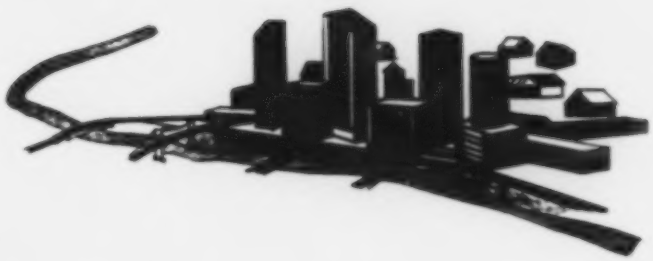
The Changing Atmosphere At Bigtown

All molecules aren't crazy about their journey through Bigtown, a city with several industries sending *emissions* into the air which contribute to the smog hanging over the city. Both the human population and the automobile population seem to have doubled during the past ten years and they all seem to be on the road at the same time.

DID YOU KNOW?

Atmosphere Knows No Political Borders

Because air currents carry smog from cars, diesel engines and factories far away from the pollution source, airborne pollutants from the Soviet Union, Europe, and North America contribute to a haze in the Arctic.



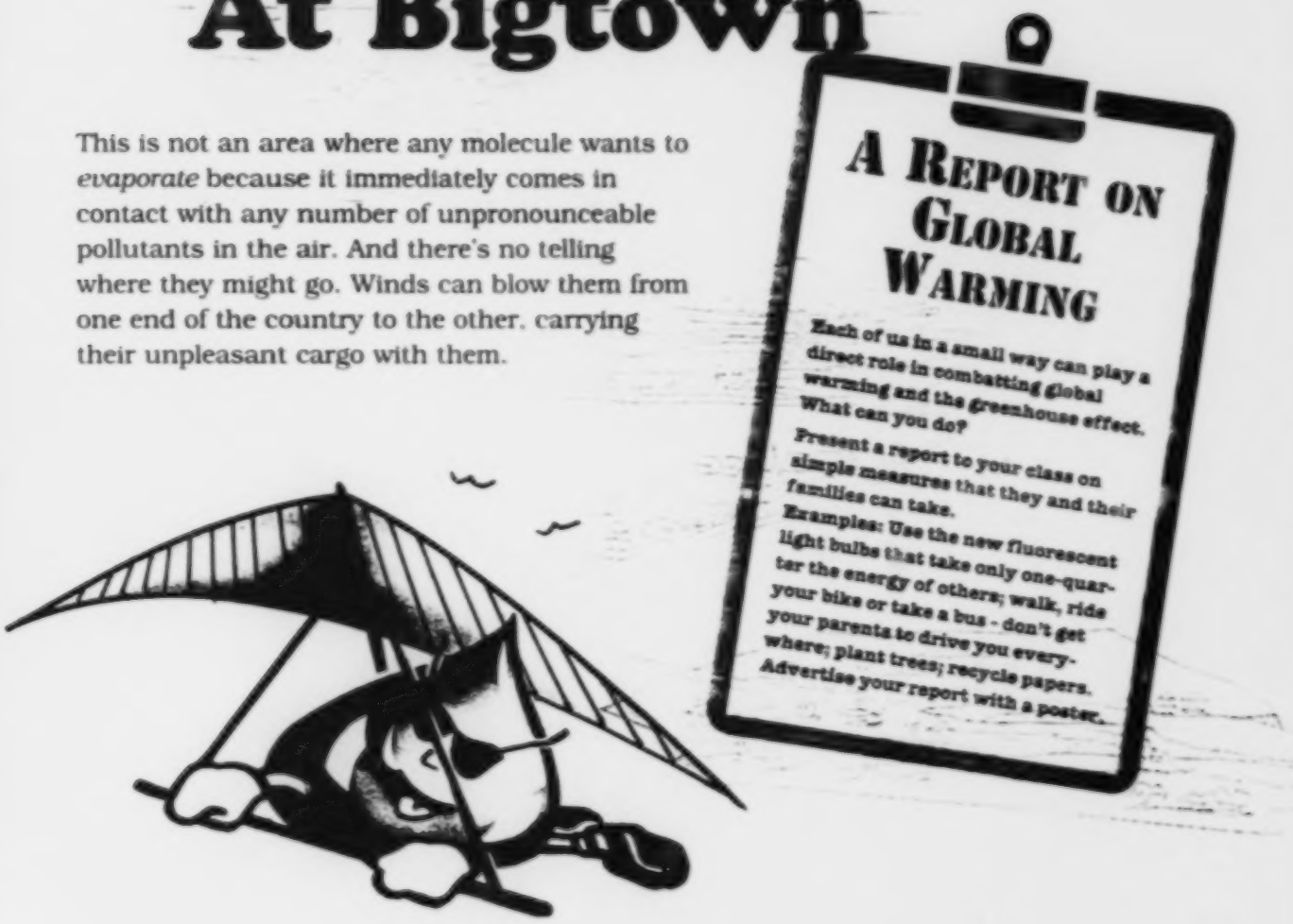
Fun Time

ATMOSPHERE

You (or your team) have 15 minutes. See who can find the most four-letter words in the word atmosphere.

The Changing Atmosphere At Bigtown

This is not an area where any molecule wants to *evaporate* because it immediately comes in contact with any number of unpronounceable pollutants in the air. And there's no telling where they might go. Winds can blow them from one end of the country to the other, carrying their unpleasant cargo with them.

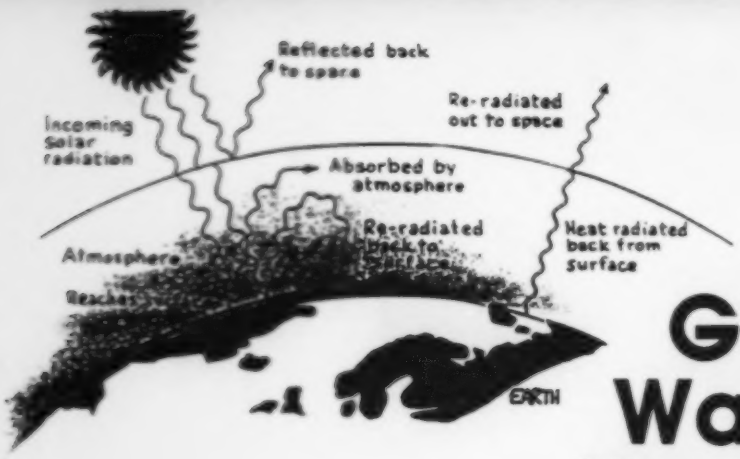

A Report on Global Warming
Each of us in a small way can play a direct role in combatting global warming and the greenhouse effect. What can you do?
Present a report to your class on simple measures that they and their families can take.
Examples: Use the new fluorescent light bulbs that take only one-quarter the energy of others; walk, ride your bike or take a bus - don't get your parents to drive you everywhere; plant trees; recycle papers. Advertise your report with a poster.

Mount St. Helens

On May 18, 1980, Mount St. Helens erupted. On May 22, 1980, fine grey ash from the volcano was scattered in Atlantic Canada.

Where is Mount St. Helens? How far did the ash travel?

What is significant about this information in terms of environmental pollution?

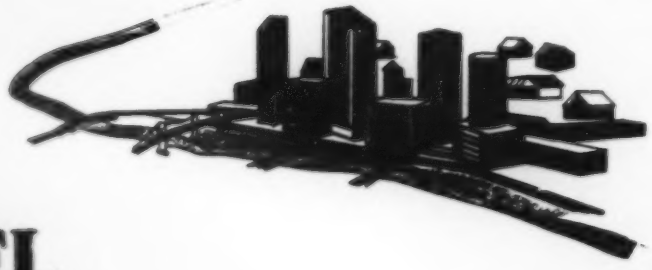


Global Warming and the Greenhouse Effect

Natural gases in our atmosphere act like a blanket, or the glass of a greenhouse - they keep the surface of the earth warm. Unfortunately, increases of gases like carbon dioxide from human activities add to this naturally occurring *greenhouse effect* and trap more heat than we need in our atmosphere. This causes a general *global warming*,and it is predicted that by the year 2050, global temperatures may rise from 1.5 to 4.5 degrees Celsius. This warming could have serious global impacts.

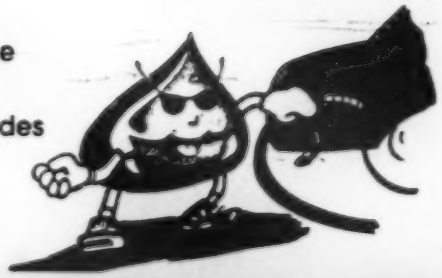
The main *greenhouse gases* are:

1. *Carbon dioxide (CO_2)* - emitted through the burning of *fossil fuels* such as coal, natural gas, oil and wood. Driving your car, heating your home, and most production processes increase CO_2.
2. *Chlorofluorocarbons (CFCs)* - used in the production of some plastic foam insulation and electronic equipment; contained in car air conditioners, refrigerators, spray cans, and other products. CFCs destroy ozone in the stratosphere and account for 15%-20% of the increasing greenhouse effect.
3. *Methane* - a naturally occurring greenhouse gas which has increased because of human activities.
4. *Nitrous Oxide* - is produced in the soil and water and acts as a natural plant fertilizer. However, the burning of fossil fuels and wood, and the use of chemical fertilizers have increased the amount of nitrous oxide in the atmosphere. One third of the nitrous oxide found in the atmosphere comes from human sources.
5. *Ozone* - a natural gas which acts as a shield in the upper atmosphere to protect us from the sun's harmful ultraviolet rays. In the lower atmosphere, however, it is a major component of urban smog and comes mostly from automobile exhaust and coal-burning plants.



FUEL

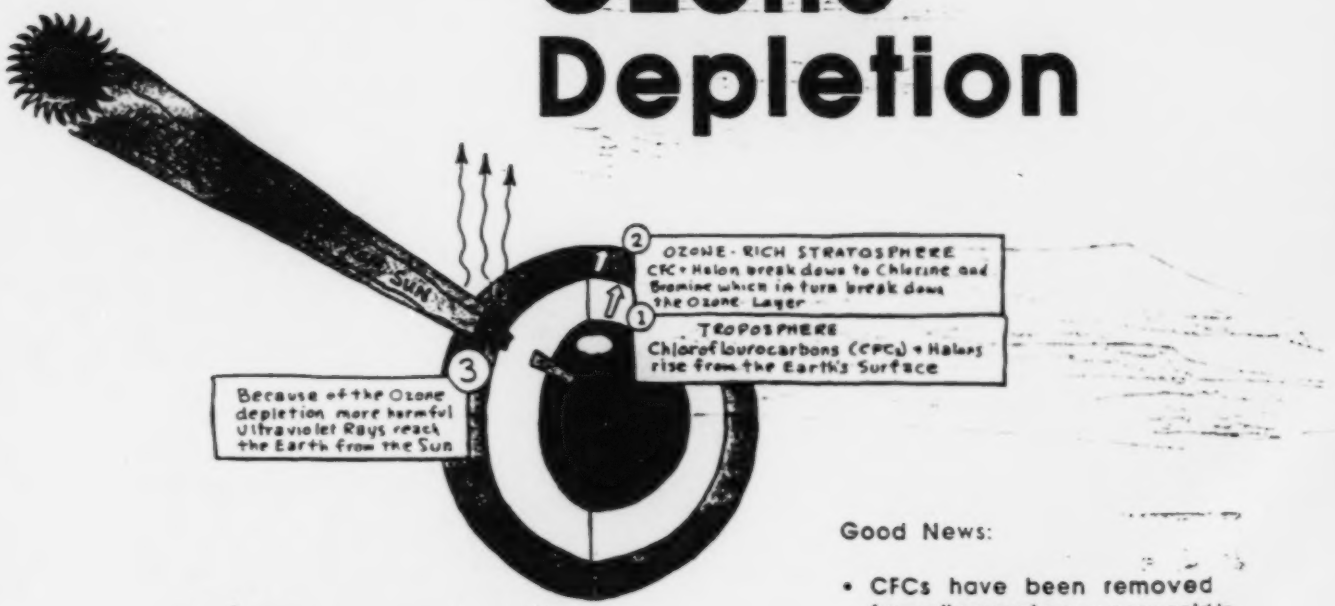
What does "fossil" mean? Why are these fuels called "fossil"? What other kinds of fuels are there besides fossil fuels?



The Changing Atmosphere At Bigtown

Some of the materials which go into the atmosphere also contribute to global warming (the greenhouse effect), the depletion of the ozone layer and acid rain.

Ozone Depletion


SUN
1
1
1
2
OZONE - RICH STRATOSPHERE
CFC + Halon break down to Chlorine and Bromine which in turn break down the Ozone Layer
TROPOSPHERE
Chlorofluorocarbons (CFCs) + Halons rise from the Earth's Surface
3
Because of the Ozone depletion more harmful Ultraviolet Rays reach the Earth from the Sun

The protective ozone layer high in the atmosphere is threatened by CFCs which slowly float upward from the lower atmosphere. In the upper atmosphere the intense ultraviolet rays break down the CFCs to other chemicals which destroy the ozone. This results in the gradual thinning of the ozone layer and allows more ultraviolet rays to reach the earth's surface.

Good News:

- CFCs have been removed from all aerosol spray cans sold in Canada (except for certain limited medical use).
- Food packaging foam (egg cartons, meat trays, fast-food containers, foam cups) no longer contains CFCs when sold in Canada. However, these items tend not to be recyclable and contribute to ever-increasing amounts of garbage.
- Small portable fire extinguishers no longer contain halogens, a chemical product that destroys the ozone.

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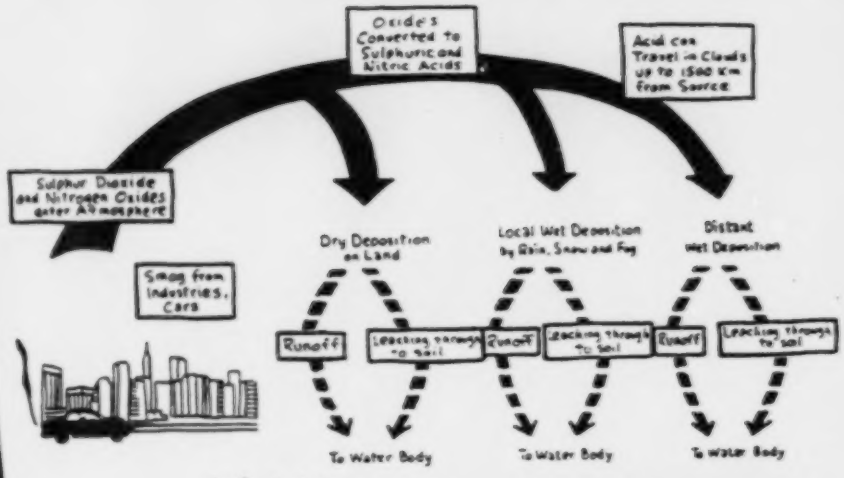
Acid Rain

Change Automobile Use

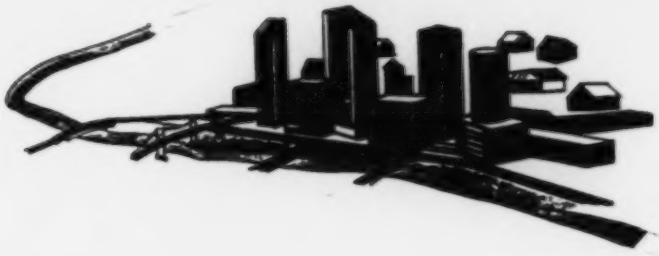
Your group has been asked to study the implications of decreased automobile use in Canada and to make suggestions for decreasing automobile use.

1. How would this affect the Canadian economy?
2. What effect could it have on the global environment?
3. How would it affect your family? (Brainstorm: Who would object to this decrease? Why? List.)
4. What are your suggestions for changing the way we use automobiles?
5. What would be the advantage if your family bought a car without air conditioning?
6. How could buying a smaller car help the environment?


Oxides Converted to Sulphuric and Nitric Acids
Acid can Travel in Clouds up to 1500 Km from Source
Sulphur Dioxide and Nitrogen Oxides enter Atmosphere
Smog from Industries, Cars
Dry Deposition on Land
Local Wet Deposition by Rain, Snow and Fog
Distant Wet Deposition
Runoff
Leaching through to Soil
Runoff
Leaching through to Soil
Runoff
Leaching through to Soil
To Water Body
To Water Body
To Water Body

Acid rain is caused by emissions of sulphur dioxide and nitrogen oxides. The main sources of sulphur dioxide are coal-fired power generating stations and non-ferrous ore smelters. The main sources of nitrous oxide emissions are vehicles and fuel combustion.

Once these emissions are released into our atmosphere, they can be carried long distances by winds and returned to earth in the form of acid rain, snow, fog or dust. Acid rain increases the acidity of soil, water and shallow groundwater, which in turn, threatens forests, *aquatic* species and waterfowl species.



The Changing Atmosphere At Bigtown

Atmospheric News!

Organize a newsletter to inform others about threats to our atmosphere.

- Research the impact on all parts of the ecosystem such as trees, wildlife, groundwater, lakes, etc., in your area.
- What laws are in place right now to protect our atmosphere?
- What laws are planned for the near future?
- Look for "good news" stories.
- Are there people in your area you could interview, like scientists, environmental experts, politicians, etc.?
- Prepare drawings, illustrations, pictures.
- Write stories, poems, songs, puzzles to increase awareness.
- Organize a bulletin board for news articles.
- Arrange an eyecatching layout for your newsletter.
- Include a "What you can do" section.
- Write letters to politicians. If you have not been politically active before, now is the time to start. Make sure your letters are properly written. Check with teachers and parents before mailing them. You do want to be taken seriously.

Problem Solving and Air Pollution

Automobiles account for more of the world's air pollution than any other source.

You are the world's expert on problem solving and air pollution. You recognize that each of the following groups has helped contribute to the problem and each has to help with the solution:

- Consumers
- Automobile manufacturers
- Politicians
- Oil and gas indnstry

As a consultant to each of the four groups, you have two tasks:

1. Identify how they have been part of the problem;
2. List ways they can be part of the solution. (What advice can you give to your parents about controlling automobile pollution?)

DID YOU KNOW?

Historic Sites

All across the country there are over 100 Historic Sites which are administered by the Canadian Parks Service. They preserve, for all of us, examples of Canadian history. Maybe there is a historic site in the area you live.

Lowertown-By-The-Sea

As Eco River moves through Bigtown the molecules are happy to be heading to their favourite vacation spot, Lowertown-By-The-Sea. They like it here because they get a chance to move through a clean environment before they flow into the ocean, and also, they get to soak up a bit of history. Part of the riv er flows by restored buildings near the waterfront which has become a National Historic Site. The port now looks like the original harbour where the first European settlers lived when they came to Canada.

Compose a Poem

Make up limericks describing how people can help:

"There once was a young man named Fred
Who cleaned up a small otter's bed,
....."

Create Cinquain and Diamante poems to describe an endangered animal. What if you were one of these animals? Use poetry to describe how you feel.

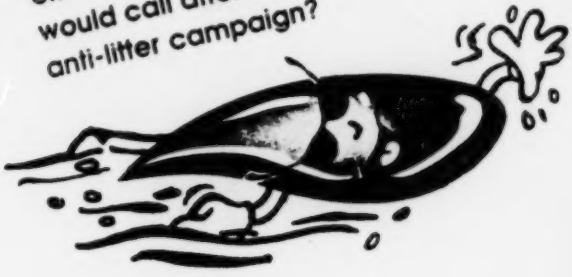
Lowertown-By-The-Sea

Lowertown-By-The-Sea was not always a molecule's paradise. This seaside town formed committees and began a cleanup campaign fifteen years ago because the citizens realized the value of a clean environment. Their fishing industry was not as prosperous as it once was so they concentrated on building a tourist attraction based on the beauty of their natural surroundings. The tourist attractions which they concentrated on and which now serve as a model for other communities are:

- Bird and animal sanctuary
- Wetland preserve
- Reforestation site
- Treed streets
- Bicycle paths and hiking trails through the countryside
- Community beautification programs
- Clean beaches.

Lowertown-By-The-Sea

If you lived in Lowertown-By-The-Sea and were asked to work on one of the above committees, which would you choose and why? What do you think you could add to one or another? Are there other areas you would call attention to such as an anti-litter campaign?



Clean Up Your Act

1. Your school board is having a contest to introduce a recycling program at your school. Working in your group, propose a plan which will limit waste, save money, and even earn money. Your proposal must not involve your teacher's time and the program must not cut into your school time. Present this proposal to your school principal.
2. Design a brochure for other school students that provides practical tips for good environmental citizenship. Illustrate your brochure.
3. Garbage-Free Classrooms: Compete with another class to see who can produce the least amount of garbage. Reduce. Recycle. Reuse.

   Lunch Challenge: See if either class can leave *no* garbage for a week except for compost materials like banana peels and apple cores. Reuse glass containers for drinks; reuse paper sandwich bags; reuse plastic containers.
4. Some classified ads promote a type of reuse. Find these ads in your newspaper. List types of second-hand goods for sale. What would you buy second hand? What could you sell either through classified ads or in a garage sale instead of throwing it out. Or, you could take goods to a second-hand store where they can be sold to other people who can use them.

Activities For You To Do!

Write a Children's Book

Write and illustrate a book which would appeal to younger children. Use a wildlife animal to tell the story. Or tell about a day in the life of an animal. Use very simple language and bright colourful pictures. Get permission from a teacher of younger children and read your stories aloud. Ask the librarian if you can display your books in the library.

Read the Newspaper

Newspaper articles are written using the 5 W's and H. Find an article about an environmental disaster or success story and answer the following questions:

1. What happened?
2. When did it occur?
3. Where did it occur?
4. Why did it occur?
5. Who was responsible?
6. How will it have an effect?

Write an editorial. Give your opinion about this happening.

Help the Environment

Think of all the things you and your family can do to help the environment.

List 10 things under each of the following headings:

a. Changes that would cause little or no sacrifice;
b. Changes that would cause some sacrifice and some inconvenience;
c. Changes that would cause significant sacrifice and major inconvenience.

Design a poster showing one of the following:

- How to make compost
- How to build a bird feeder or birdhouse
- How to transplant a tree
- How acid rain develops
- How individuals can conserve water.

Design Bumper Stickers

Create humourous bumper stickers which carry an environmental message. Example: "You otter treat the otters well" or "Every litter bit hurts."

Activities For You To Do!

Give an Environmental Citizenship Award

Create an award for good environmental citizenship.

Select an individual, company, industry, etc., which has done something positive for the environment.

Write a letter to them and to your local paper commending their work in your area.

Study Advertising

Study ads for automobiles in newspapers, magazines and on television. Do these ads promote or advertise environmental features of their product?

Design your own ad to promote a car you have had especially built which will not add to environmental pollution.

Dramatize Your Concern

Pretend you are a journalist; prepare a short message about an environmental issue.

Broadcast it in the classroom as a radio or television commercial.

Prepare a Safety Poster

Have you ever heard the weather person saying, "There is a severe weather warning in effect. Police are advising people to stay indoors...?"

Severe weather safety is important to Canadians. Because Canada is so large, we experience a variety of weather conditions. For example, summer weather can bring thunderstorms, hail, lightning, tornadoes and heat spells. Winter weather can bring blizzards and wind chill conditions.

Which of these severe weather conditions are likely to occur where you live? Do you know what to do as a precaution against injury in these situations? Did you know that the Atmospheric Environment Service of Environment Canada can provide you with the safety "do's and don't's" for severe weather?

For information, contact:
Atmospheric Environment Service
Weather Services Directorate
Environment Canada
4905 Dufferin Street
Downsview, Ontario
M3H 5T4
Tel: (416) 739-4940

Prepare a safety poster for smaller children which will highlight for them what to do if they get caught in a severe weather situation. Use an animal as your "spokes-character," for example, "Spike the Otter says, ..."

Be a Scientist

Design a scientific experiment showing the effects of something good or bad on the environment. For example: How biodegradable are certain materials? Compare packaging materials by exposing them to the weather over a period of time. Example:

Plant a Reverse Garden

Most people plant to see things grow, you will now plant to see things fall apart.

You will need:
an old cotton rag (100% cotton is a must)
an old nylon stocking
100% wool
waxed paper
apple core
polystyrene
newspaper

Dig a 12-cm hole for each item, cover with soil, dampen completely (make sure you mark each), leave for 30 days and water regularly.

When you dig up your garden notice how things have changed.

The next time you are camping, think of the reverse garden before throwing anything away. (A similar study can be done by exposing different materials to sun, wind and rain over a period of time.)

Survey Transportation in Your Community

Find out how many adults in your neighbourhood ride bicycles to work. Find out why they do or don't. (Does your community have bike paths?)

Who uses public transit? car pools? walks? Present your findings to the class.

Put Yourself in the Place of a Raindrop

Prepare a diary, travelogue, cartoon description, or story about a month in the life of a raindrop which lands in your region. Where did it come from? What adventures did it have?

Be a Politician

What legislation would you enact to bring about changes in our environment? If there was one thing you could change, what would it be? How would you change it?

Become a Playwright

Write a play, skit, story or long poem, "A Day in the Life of Irresponsible Iggy."

Activities For You To Do!

Learn About Endangered Wildlife

There are 183 species of plants and animals in Canada that are endangered. These include the following: prairie rose, small white lady's slipper, eastern wolverine, Pacific giant salamander, eastern Arctic bowhead whale, St. Lawrence beluga whale, Pacific sardine, eastern cougar, sea otter, Vancouver Island marmot. There are many others.

Research:

- Obtain a complete list of threatened wildlife from Canadian Wildlife Service, Environment Canada, Ottawa, Canada, K1A 0H3.
- Why does a species of wildlife become endangered?
- From the list of threatened and endangered species select an example for your research. Find out what forces are having the most impact on its survival.
- What is being done to save this species? What actions can you take and what would you recommend to others?
- Interview your animal for its viewpoint.
- Design a display to illustrate your research.

Conduct a Restaurant Survey

Identify waste problems caused by the fast-food industry.

Chart the garbage which comes from such a restaurant. Divide it into the three groups:

i. Recyclable
ii. Biodegradable
iii. Disposable

What would you suggest to the restaurant to help cut down on its garbage?

What are four ways that you and your community can help make the fast-food industry more environmentally responsible?

Ask Yourself about What We Take for Granted

Compare a day in your life with someone your age in an African country who spends the morning carrying water from a well to home more than 1 kilometre away.

- Fill a bucket with water and find out how heavy it is.
- List your family's use of water for the first hour of the morning. What would you give up if you had to carry the water?
- In what other ways would your life change if half your day were spent carrying water?
- Are there ways your family wastes water? Make a list.

Environmental Puzzles

CROSSWORD PUZZLE A

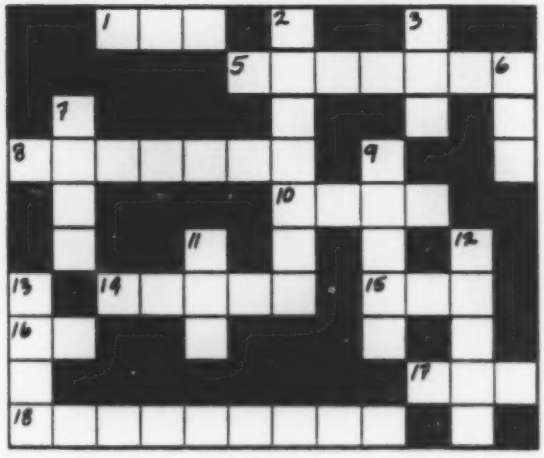
Across

1. *water in its frozen state*
5. *habitat for ducks and geese*
8. *the study of ecosystems*
10. *chlorofluorocarbons (abbreviation)*
14. *protective gas high in the atmosphere*
15. *what we breathe*
16. *Environment Canada (abbreviation)*
17. *we all benefit from wise water ___.*
18. *cities use wastewater _____ plants to purify water.*

Down

2. *what we should do with used newspapers*
3. *its emissions pollute the atmosphere*
6. *wall built to hold back water*
7. *not the kind of rain we want to fall*
9. *"all rivers flow to the _____"*
11. *chemical abbreviation for carbon dioxide*
12. *another name for garbage*
13. *water quality _____*

CROSSWORD PUZZLE A



CROSSWORD PUZZLE B

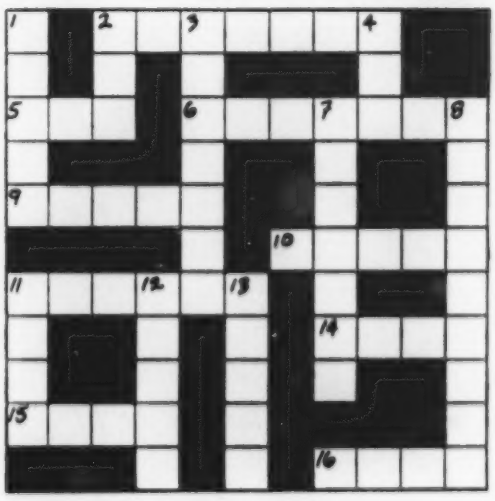
Across

2. *we dispose of this in landfill sites*
5. *Atmospheric Environment Service (abbreviation)*
6. *recyclable garbage used as natural fertilizer*
9. *another name for poison*
10. *antonym for dirty*
11. *"every _____ bit hurts"*
14. *water molecules take a journey or _____ down Eco River*
15. *wilderness land set aside by government*
16. *it takes in carbon dioxide*

Down

1. *a tree is a _____*
2. *methane is a natural _____*
3. *if we reuse something we _____ it*
4. *the name of our river*
7. *to contaminate the environment*
8. *humans breathe out. plants _____*
11. *a jump by a deer*
12. *leaky septic _____ can pollute the groundwater*
13. *one method of travel for our water molecules*

CROSSWORD PUZZLE B



BEST COPY AVAILABLE

Glossary

Abuse	to use wrongly; mistreat
Acid Rain	precipitation which is unnaturally acidic
Aquatic	living in or near water
Biodegradable	can be readily decomposed by bacteria
Biomass	total quantity or weight
Consumption	using up goods and resources
Disposable	designed to be thrown away
Drought	period of dry weather
Ecosystem	interacting organisms in a habitat
Ecology	science dealing with organisms and their environment
Emissions	substances discharged into the environment
Fossil fuels	fuels formed from plant and animal remains
Groundwater	water found underground
Habitat	natural home of plant or animal
Interdependence	depending on each other
Interrelated	connected or related to each other
Irrigate	to supply with water using ditches, canals
Landfill	a place where garbage fills up land
Percolate	to filter down, as water through soil
Pesticides	chemicals for killing insects, weeds, etc.
Pollute	to make unclean or impure
Purify	to clean
Recycle	to use again
Renewable	to be restored to original state
Sewage	waste carried off by sewer systems
Toxic	poisonous
Vapour	gas formed by heating a solid or liquid
Water Table	top level of groundwater

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Canadian Wildlife Federation, *Habitat 2000 Kit*

Manitoba Hazardous Waste Management Corporation, *Hazardous Waste Environmental Education Resource Kit*, May 1989.

Ontario Waste Management Advisory Board, *The Great Garbage Machine.*

Southam News Publications, *The Citizen*, Teachers' Resource Guide, *Our Fragile Future*, 1989.

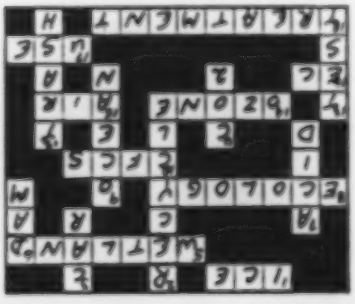
World Wildlife Fund Canada, *Operation Lifeline Kit.*

For further information please contact:

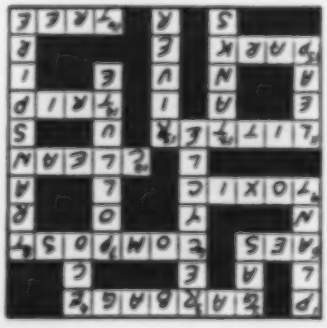
Enquiry Centre
Environment Canada
Ottawa, Ontario
K1A 0H3
Tel: (819) 997-2800
Toll free: 1-800-668-6767
Fax: (819) 953-2225

Puzzle Solutions

CROSSWORD PUZZLE A



CROSSWORD PUZZLE B



Word Scramble: ***Beluga Whale, Pelican, Panda, Sea Otter, Blue Whale, Elephant, Condor, Cougar, Wolverine***

Word Search: ***Litter***

Coded Messages: ***A: Environmental Citizenship is about becoming informed and getting involved.***

B: Use water wisely and efficiently – it's good for the environment and saves money!

Activity Book: Student Evaluation

NAME _____ GRADE _____

SCHOOL _____ TEACHER _____

ADDRESS _____

_____

_____

1. How much did you enjoy using this activity book? (Please circle the appropriate number.)

1	2	3	4	5
very much				not much

2. What activities did you enjoy the most?

page#

_____ 1. _____

_____ 2. _____

_____ 3. _____

_____ 4. _____

3. What would have made this activity book more interesting for you?

1. _____

2. _____

3. _____

4. _____

4. List 5 things you learned about the environment. (Put them in order of your own personal interest.)

1. _____

2. _____

3. _____

4. _____

5. _____

5. If you were asked to design a book on the environment for students your age, what would you include?

1. _____

2. _____

3. _____

4. _____

5. _____

Activity Book: Teacher Evaluation

NAME _____ GRADE(S) _____

SCHOOL _____ NO. OF STUDENTS _____

1. To what extent have you used this activity book?

   _____ cover to cover

   _____ selectively

2. How suitable were the activities to your students' grade level

   _____ beyond their capabilities

   _____ suitable

   _____ not challenging enough

3. What did you like about the activity book?

   1. _____

   2. _____

   3. _____

   4. _____

4. What did you not like about the activity book?

   1. _____

   2. _____

   3. _____

   4. _____

5. Do you have any general comments?

   _____

   _____

   _____

   _____

Thank you for taking the time to give us your comments. Please send them to:

"From the Mountains to the Sea"
Economics and Conservation Branch
Ecosystem Sciences and Evaluation Directorate
Environment Canada
Ottawa, Ontario
K1A 0H3

Notes

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